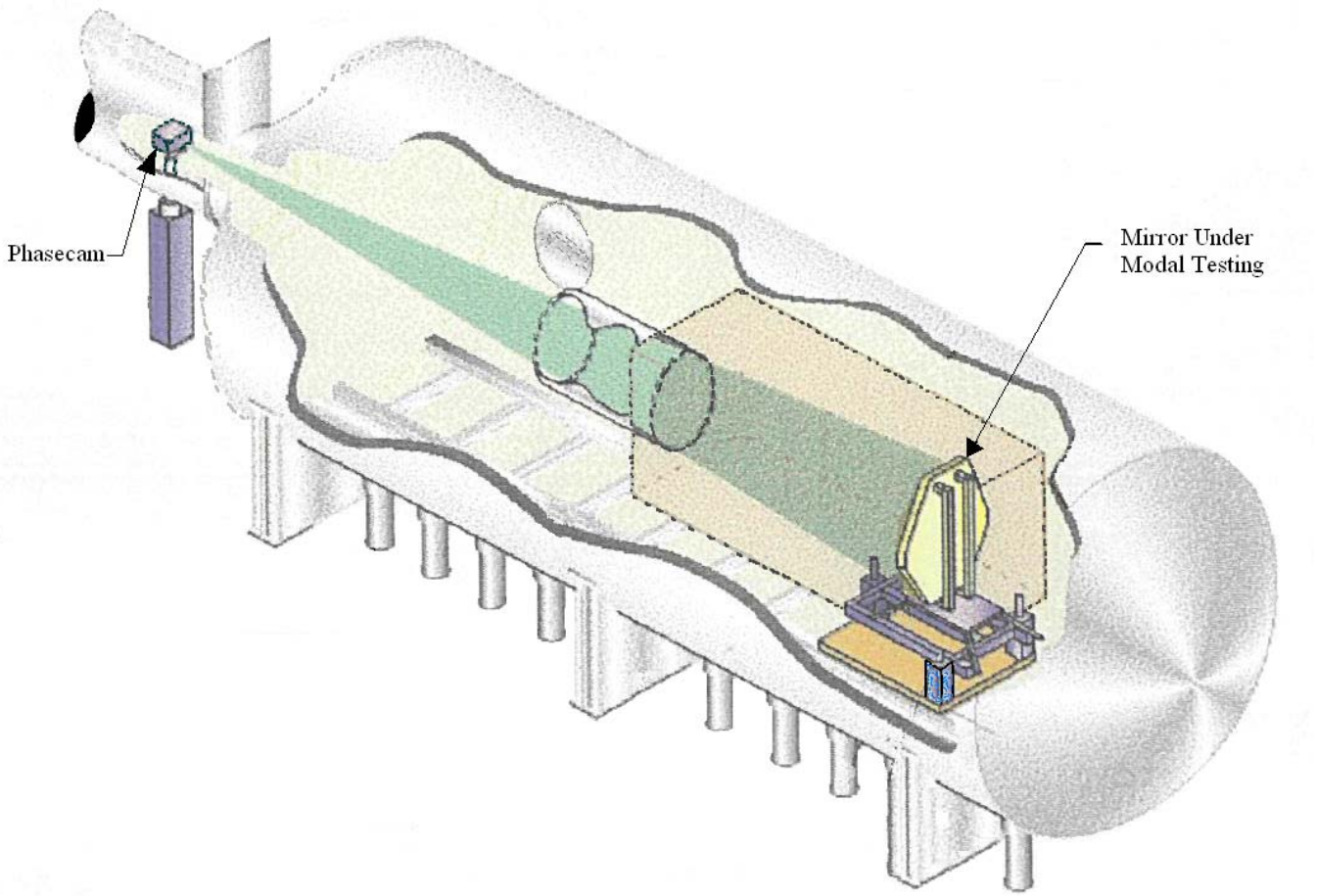
CRYO-VAC Modal Testing of AMSD Mirror



Ted Rogers, Joe Geary – CAO / UAH
Phil Stahl - Marshall Space Flight Center

MODAL TEST JUSTIFICATION

- Obtain vibration induced modal test data at ambient and cryogenic-vacuum conditions.
- NON-Contact; Full Aperture
- Validate theoretical model with experimental testing data.
- Determination of first five (5) out-of-plane modes of mirror displacement as required by AMSD.

PROJECT PROGRESSION

PHASE I:

- Proof of Concept
- Demonstrate Phase – synchronized data acquisition
- Adjustable Phase Triggering

PHASE II:

- Integration of modified Phasecam Modal System into proof-of-principle set-up

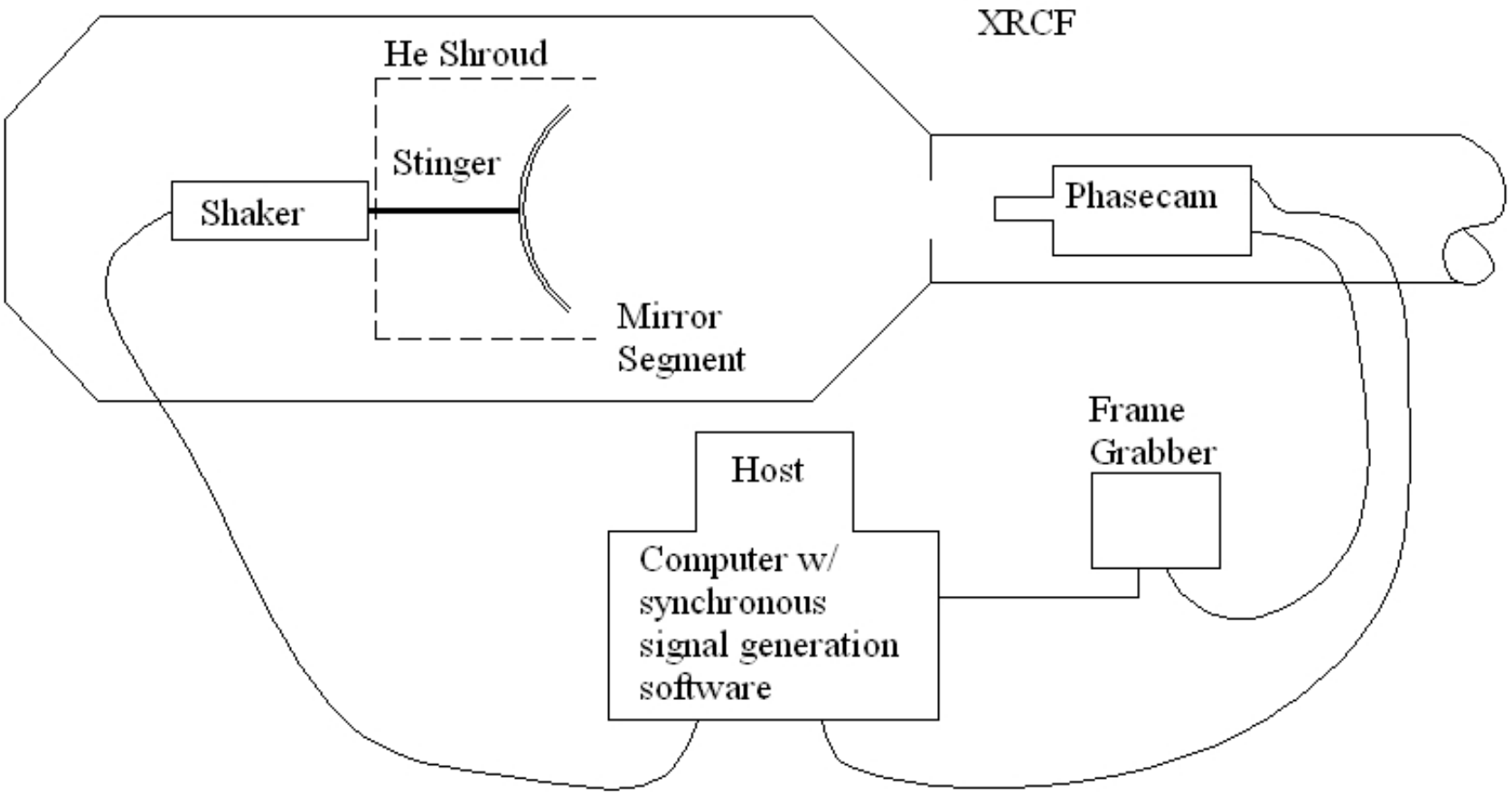
PHASE III:

- Integration of Modal System into XRCF with TBD test mirror

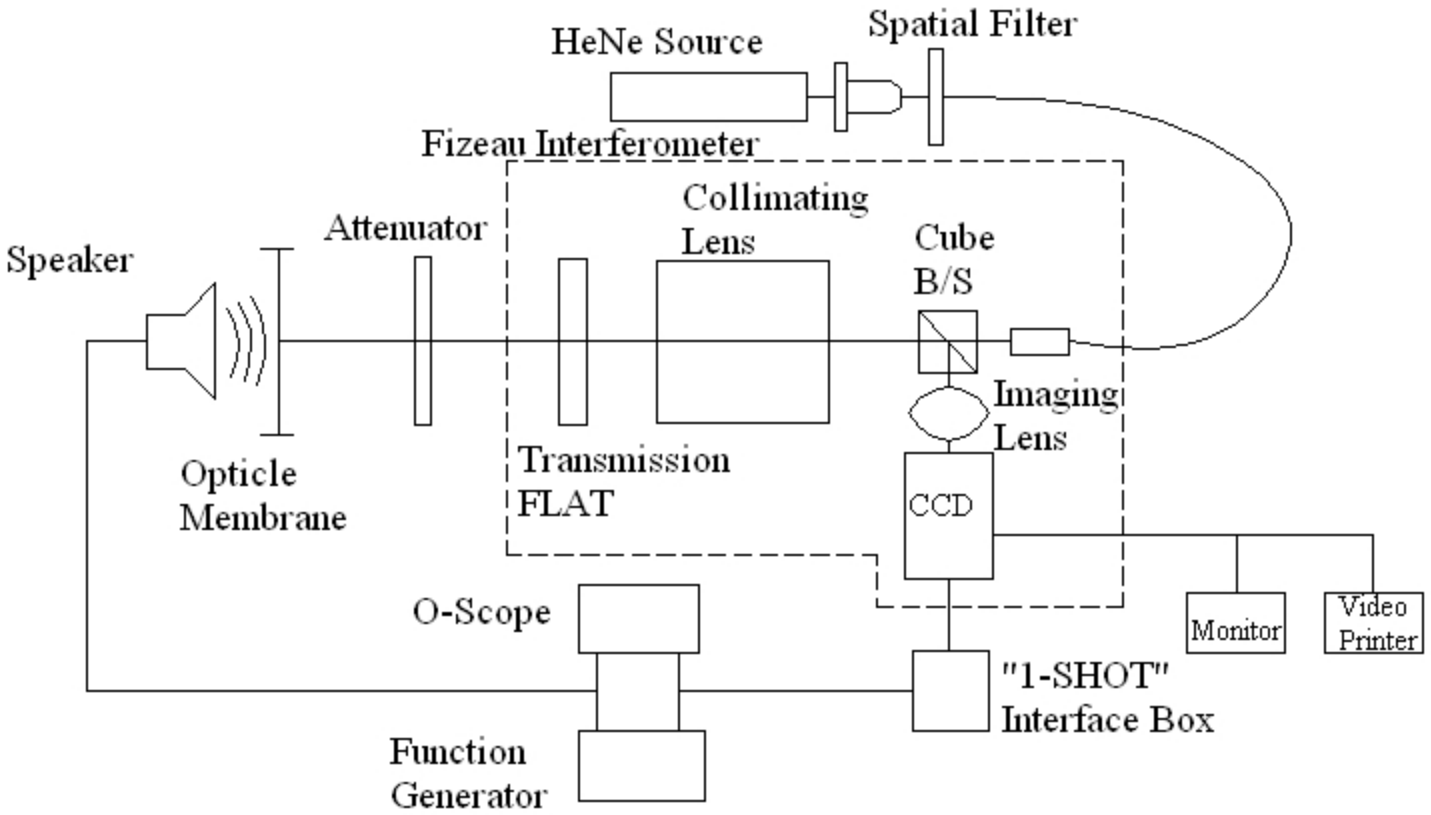
PHASE IV:

- Full CRYO-VAC Modal test of AMSD Mirror Segment

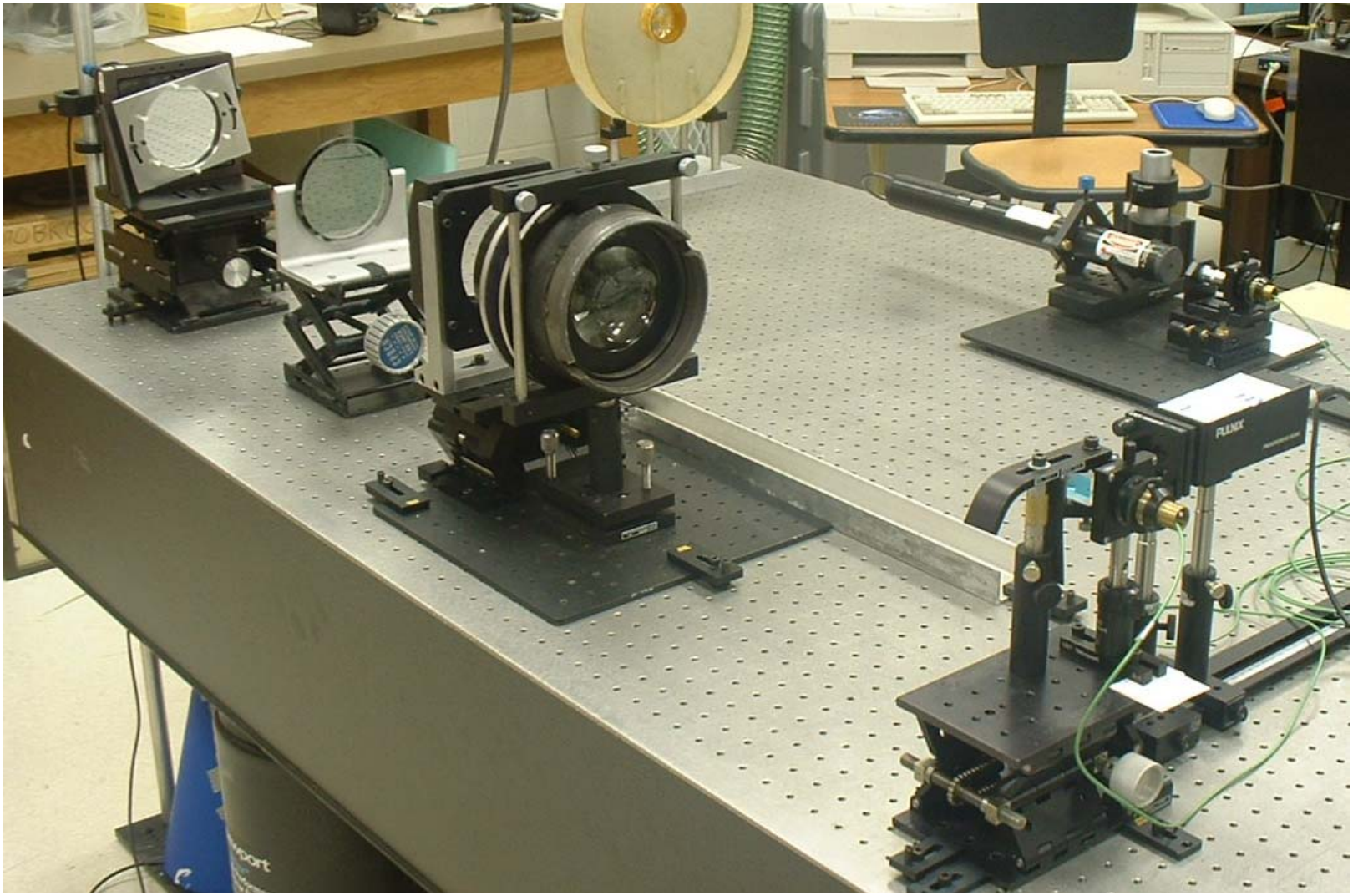
PHASE IV: PROSOSED AMSD CRY-VAC MODAL TEST



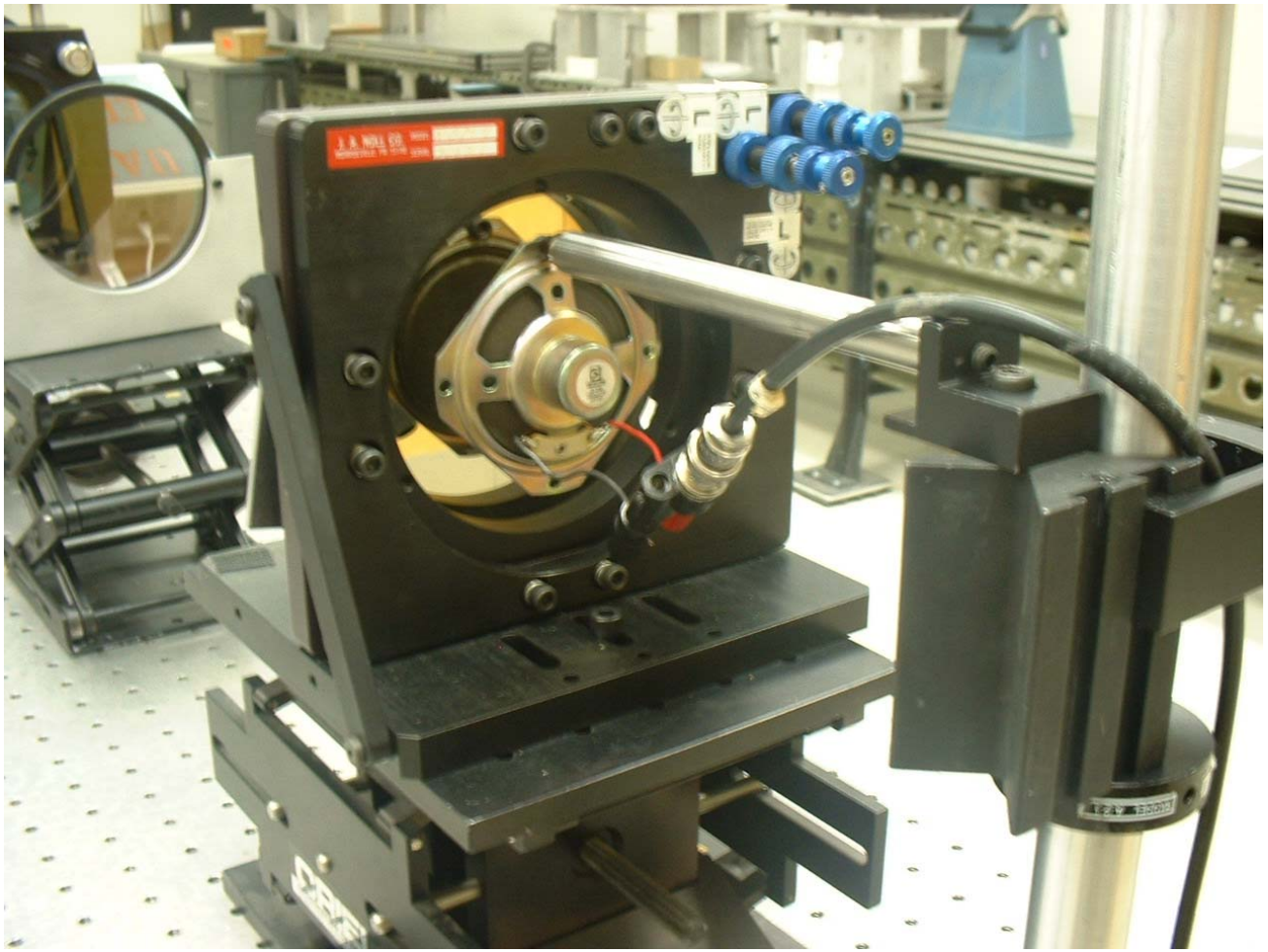
PHASE I : Proof-of-Principle Layout



Optical Path Layout



Speaker and Membrane

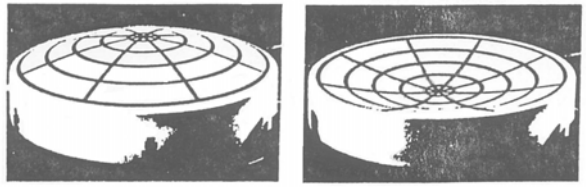


Examples of Drum Head / Membrane

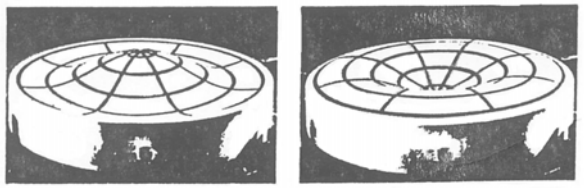
Vibrating in Natural Modes.

MODES

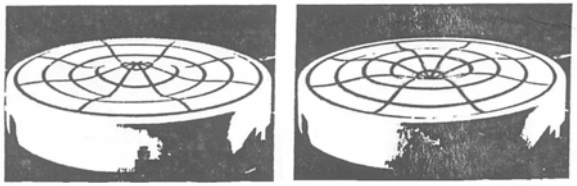
(0,1)



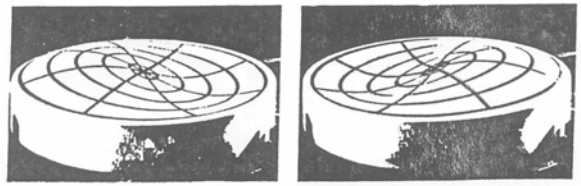
(0,2)



(0,3)



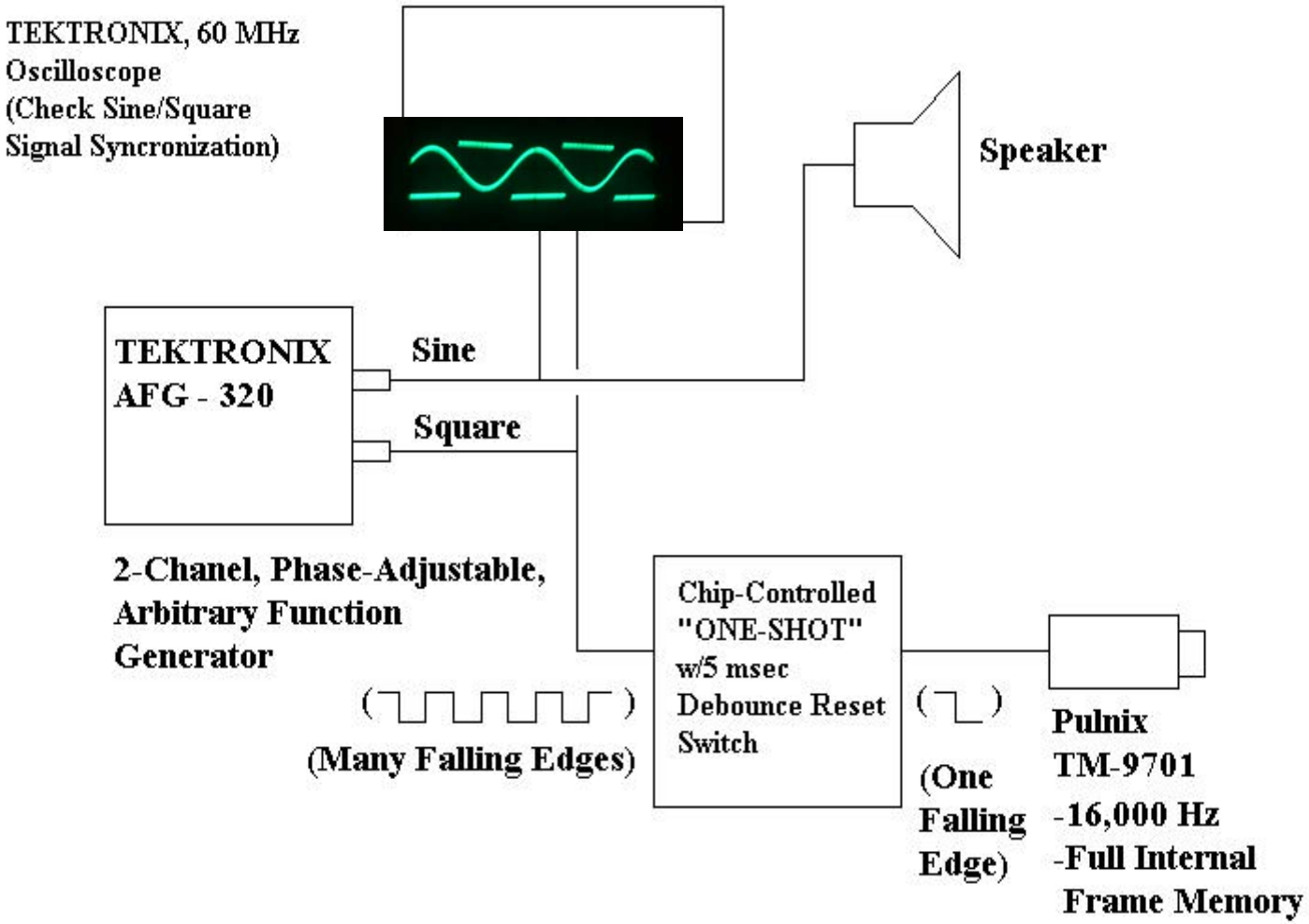
(1,1)*



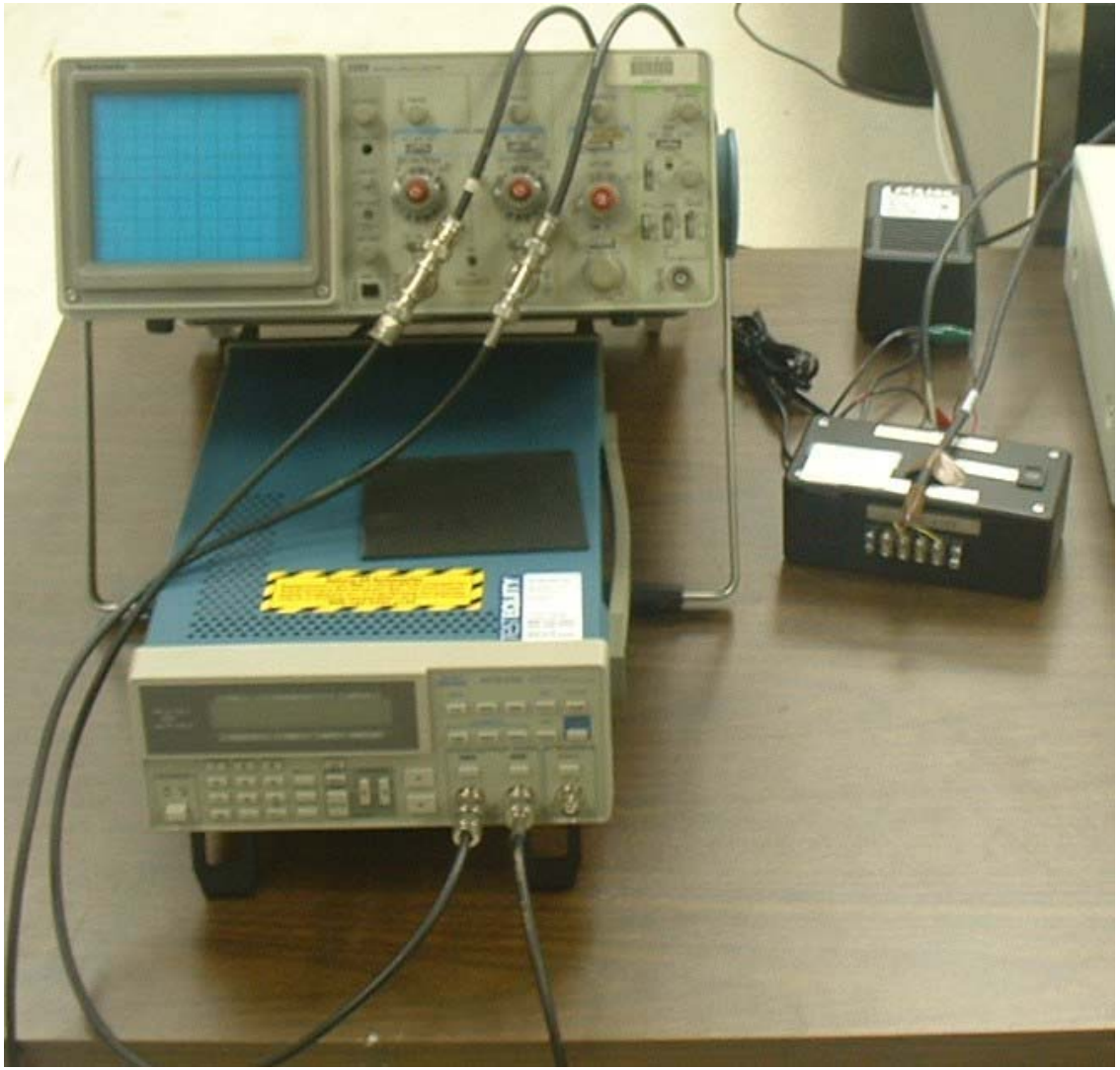
*** Actual Mode (1,1)**

Interferograms to follow

ELECTRONICS



Acoustic and Trigger Signal Generation

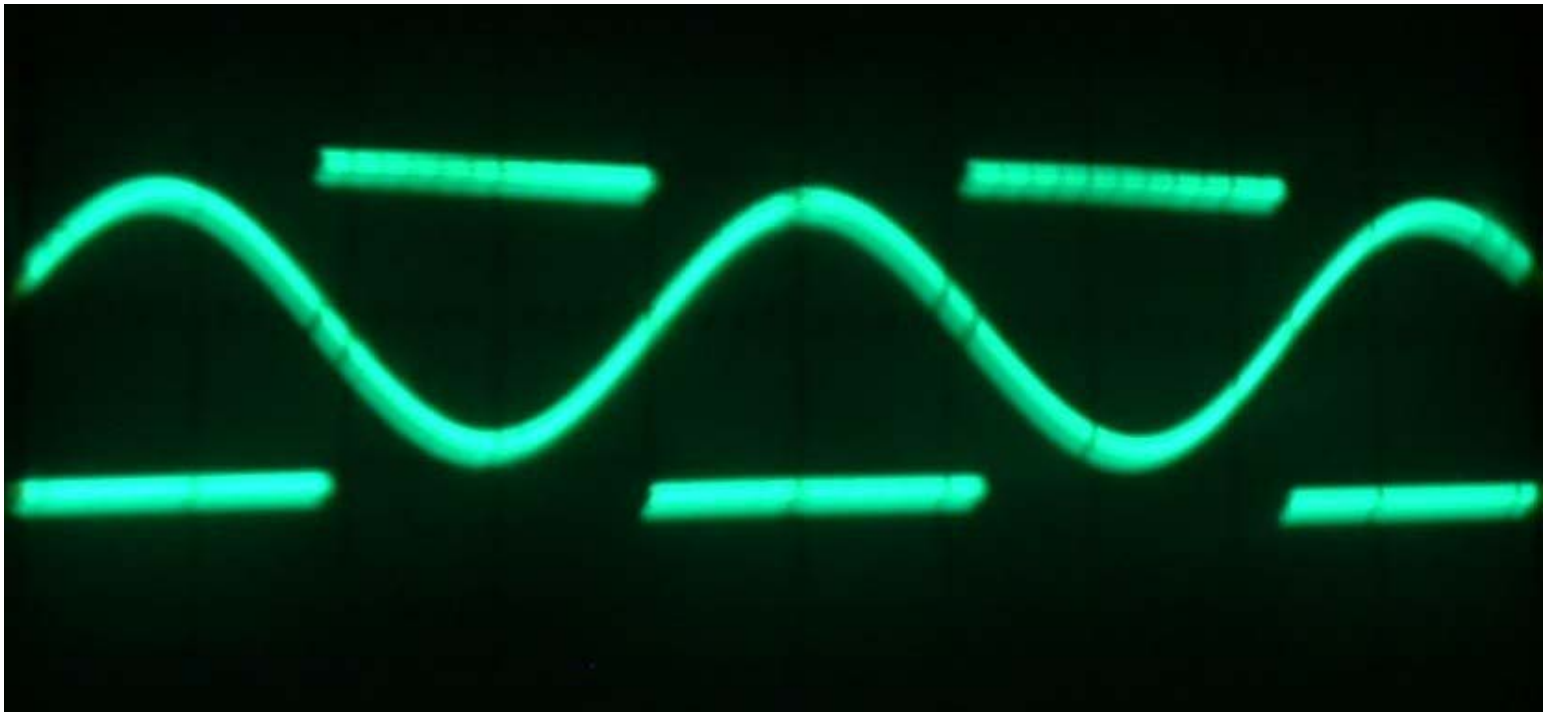


SIGNALS

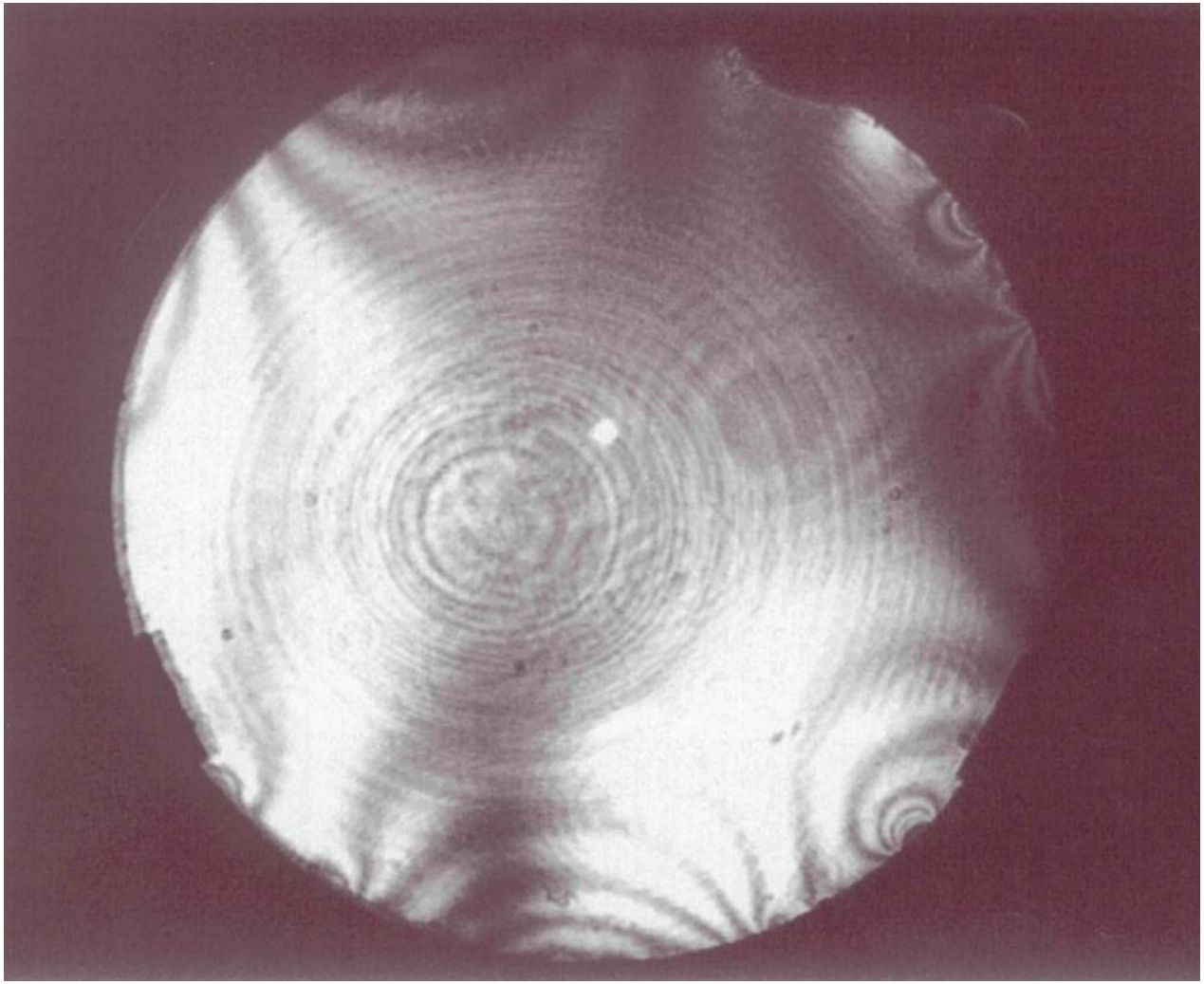
Trigger Signal – (Square Wave, Falling Edge)

Acoustic Signal

(Sine Wave)

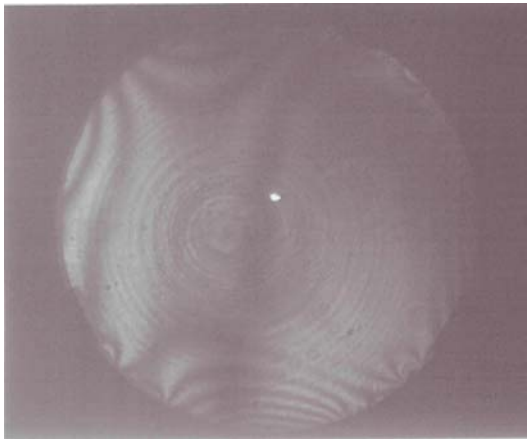


INTERFEROGRAM OF FLAT PELLICLE

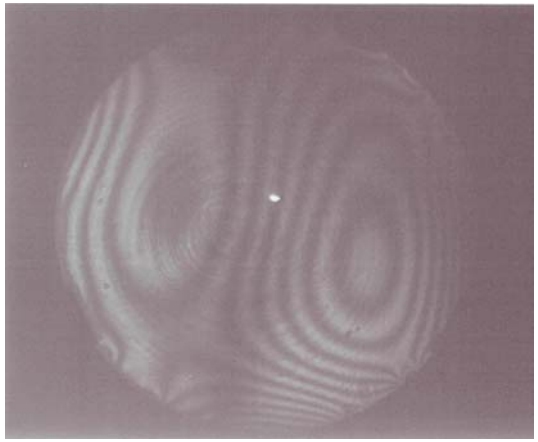


PHASE STEPPING THROUGH MODE

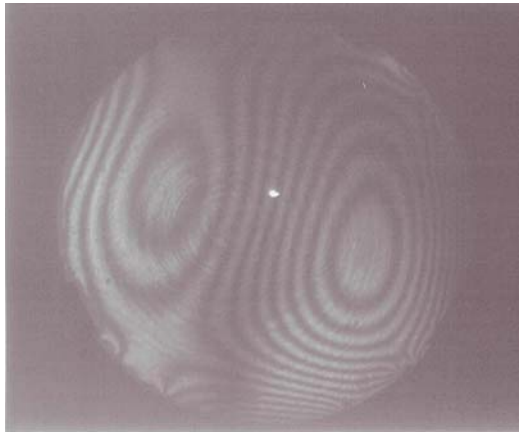
MODE (1,1) @ 356 Hz



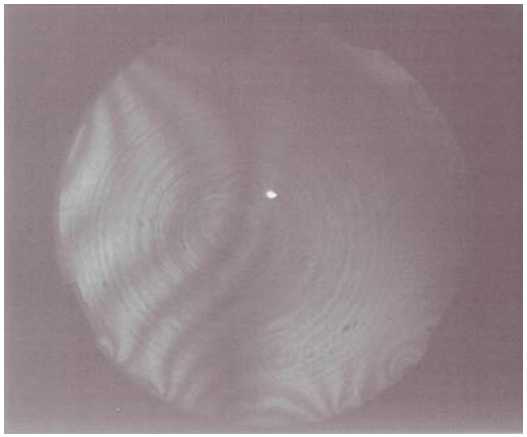
0 degree PHASE



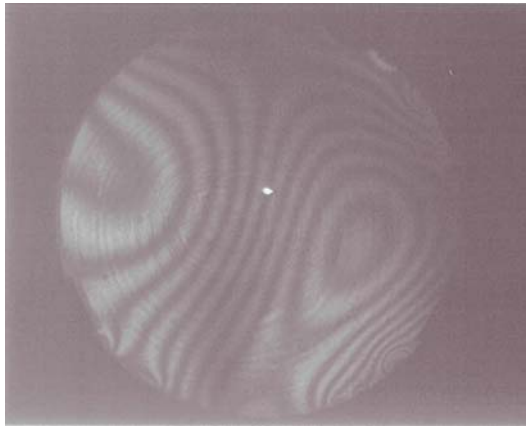
60 degree PHASE



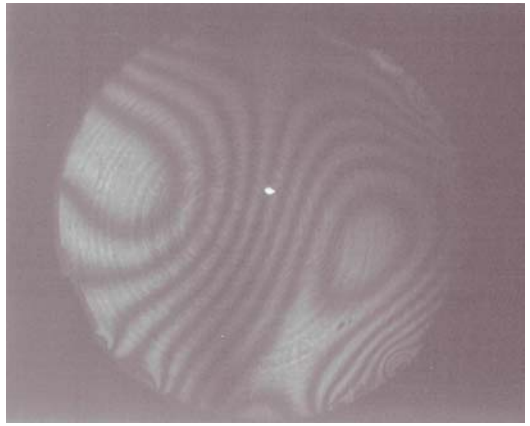
120 degree PHASE



180 degree PHASE

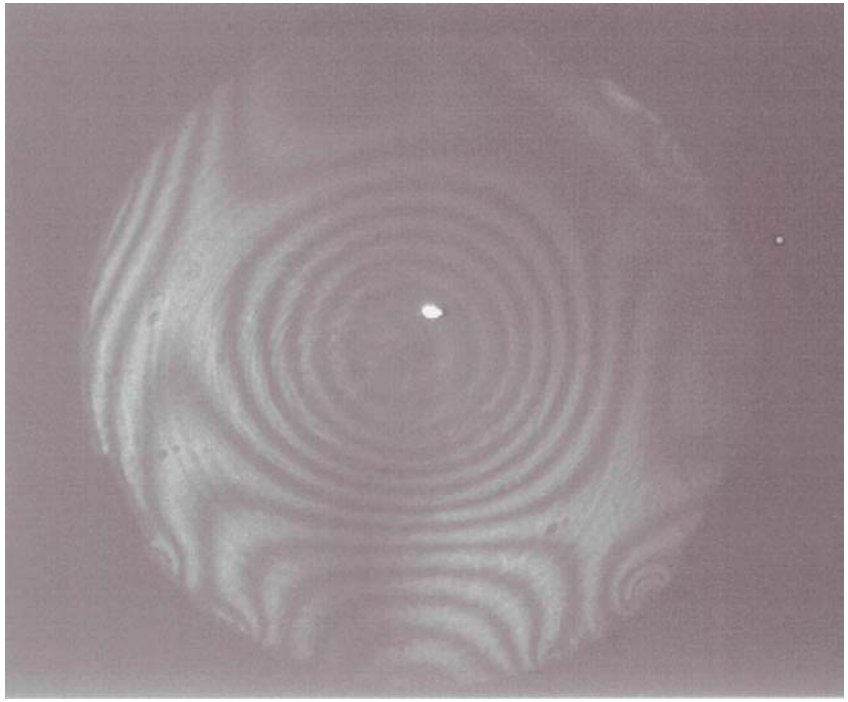


240 degree PHASE

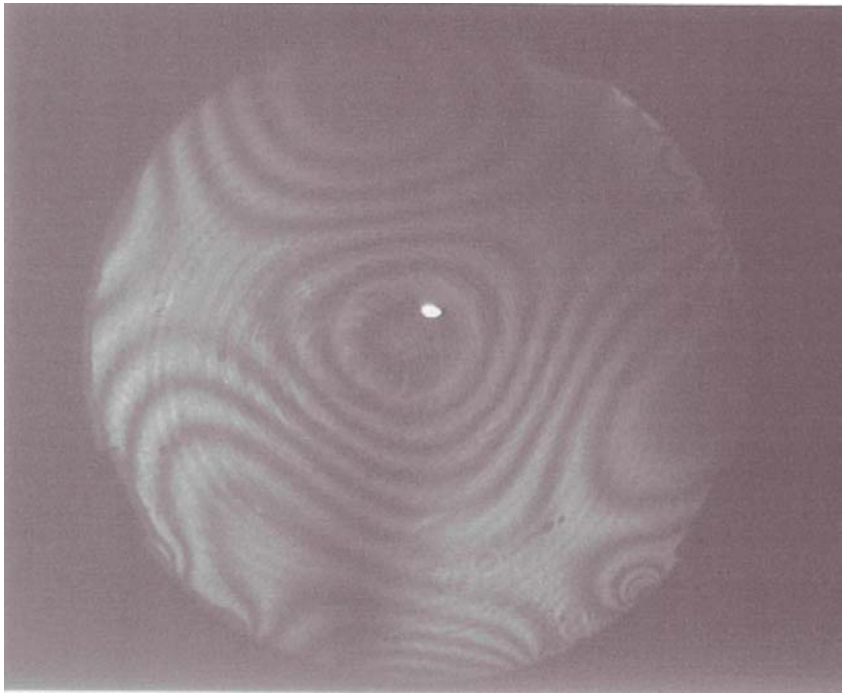


300 degree PHASE

HIGHER MODES



MODE (0,2) @ 644 Hz



MODE (3,1) @ 760 Hz

PHASE II: Phasecam Integration